Knowledge Diffusion, Innovation and Reallocation: The Role of the IT Revolution

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Abstract:

How did the IT revolution affect aggregate productivity growth and sectoral reallocation over the past decades? In this paper, I analyze the effect of information and communications technologies (ICT) through their impact on knowledge diffusion in the economy. There are two opposing effects. The increased flow of ideas between firms and industries improves learning opportunities and spurs innovation. However, knowledge diffusion through ICT also results in broader accessibility of knowledge by competitors, reducing expected returns from research efforts and hence harming innovation incentives. The nature of the tradeoff between these opposing forces depends on an industry's technological characteristics, which I call external knowledge dependence. Industries whose innovations rely more on external knowledge benefit greatly from knowledge externalities and expand, while more self-contained industries are more affected by intensified competition and shrink. This results in the reallocation of innovation and production activities toward more externally-focused, "knowledge-hungry" industries. I develop a general equilibrium endogenous growth model featuring this mechanism. In the model, firms belonging to technologically heterogeneous industries learn from external knowledge and innovate. These firms' abilities to access external information is influenced by ICT over time. Using NBER patent and citations data together with BEA industry-level data on ICT, I empirically validate the mechanism of the paper. Quantitative analysis from the calibrated model illustrates that it is important to account for both technological heterogeneity and the knowledge-diffusion role of ICT to explain U.S. trends in productivity growth and sectoral reallocation in recent decades. Counterfactual experiments are conducted to quantitatively assess separate channels and illustrate various growth decompositions.